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Depression, Obstructive Sleep Apnea and Psychosocial Health

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Abstract

Depression and Obstructive sleep apnea (OSA) are the major associated comorbidities. OSA is a rapidly growing problem in the society that is connected to the rising rates of obesity; at the same time, the depression rate is also increasing day by day. Patients with OSA present with sleep problems, anxiety, and depressive symptoms, depressive patients can also present with the same symptoms. The quality of an individual's health can be improved by the early detection of the symptoms of overlapping OSA and depression. By addressing these issues early, the associated healthcare costs and burden can be reduced simultaneously.

Keywords

CPAP; Depression; OSA; Psychosocial; Sleep; Natriuretic peptide

Introduction

Many symptoms of depression and obstructive sleep apnea overlap, causing under-diagnosis of obstructive sleep apnea (OSA) in depressed patients. OSA patients can present with major depressive symptoms, but it is highly recommended that the primary care physician should determine the underlying cause of depression rather than simply diagnosing the patient as depressed. Patients with OSA have a higher prevalence of depression than the general population [1]. Major depressive disorder can be ruled out by presenting patients with different questionnaires e.g., the Beck depression inventory (BDI) [2] or the patient health questionnaire (PHQ-9) during primary health care services. The answers to these questionnaires should be analyzed along with the symptoms of patients and clinical

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evaluation [3]. The patient health questionnaire (PHQ-9) is a useful tool for the screening of depression. It is very easily implemented and can offer diagnostic results very quickly in the primary healthcare setting [4].

Depression and Clinical Outcomes

Depression is a risk factor for coronary artery disease [5]. Coronary artery disease (CAD) when it occurs simultaneously with depression has a greater morbidity and mortality risk in cardiac patients compared to patients with no depression [6]. Because depression is a risk factor for cardiac disease, controlling depression symptoms in patients diagnosed with mild depression can improve cardiac function; in severe depression, however, it has a worse prognosis [7]. In major depressive disorder (MDD), MRI results show that the volume of a patient's hippocampus decreases with chronic illness, not in the beginning of the depression, but significant decrease occurs after the onset of the disease [8]. In MDD, a negative emotional stimulus shows a more significantly negative response in depressed patients in regions of the brain that are involved in the processing of stimuli related to emotions compared to happy stimuli [9].

Depression and Obstructive Sleep Apnea

MDD carries with it an 18% prevalence of associated OSA; OSA has a 17.6% prevalence of MDD. There is a co-linear relationship between OSA and MDD. Both conditions present with common mood symptoms, anxiety, restlessness, fatigue, and poor concentration. In OSA patients, MDD must be ruled out before a treatment regimen can be implemented [10]. These co-related problems must be diagnosed properly to be treated effectively [11]. Some OSA patients present with the symptoms of depression, and these symptoms get better with the implementation of CPAP therapy [12]. Some OSA patients present with both OSA and depression symptoms; in these patients, both conditions need to be treated [13]. Older women with OSA present with greater decline in cognitive function than without OSA [14]. Patients with major symptoms of depression along with OSA respond to CPAP therapy and their depression symptoms gradually resolve; the patient's quality of life improves [15]. Many patients present with both OSA and major depression together [11]. The most common symptoms of OSA and depression are fatigue and sleep disturbance. Both of these problems can disguise each other because of their similar symptoms, but it is the responsibility of a clinician to treat the symptoms of a specific disease and determine the underlying cause [16]. Table 1 shows common sharing symptoms of MDD and OSA. Patients with OSA have a higher depression rate and thus have poor concentration and alertness during the day which can lead to traffic accidents and workplace accidents [17]. Figure 1 shows OSA causes sleep disturbance and could be the cause of depression, impaired psychosocial health and road traffic accidents due to sleepiness and improper judgment.

There is more cognitive dysfunction noted in OSA and obese patients compared to the general population [18]. Patients who have been diagnosed with MDD who still show some residual symptoms of depression after treatment and who show some risk factors of OSA must be screened for OSA by using polysomnography (PSG). Patients who do not improve

after taking antidepressant therapy and have symptoms of OSA should be screened for OSA and be treated with CPAP if OSA is diagnosed [19-21]. Patients who were diagnosed with MDD and treated by antidepressants but saw no improvement started to see their depression symptoms resolved when they began taking CPAP therapy [12]. Mood disorder and depressive symptoms associated with OSA can be improved by CPAP therapy, but the effect of treatment can take longer depending on the variations and severity of the mood symptoms. OSA patients need follow-up visits with their primary care physician to see the beneficial effects of CPAP therapy [22]. Depressive symptoms in OSA greatly improve after CPAP treatment. In OSA patients, hypoxemia treatment relieves sleep disturbance as well as psychological stress related to sleep apnea [23]. In MDD, CPAP therapy plays a vital role in treating residual symptoms of major depression if the patient has associated OSA as well [20]. In addition to CPAP therapy, reduction in BMI has a very beneficial effect on OSA and depressive symptoms [24]. In OSA patients neural injuries are noted in different parts of the brain compared to non-OSA patients. Depressed patients also show a loss of gray matter. Depression exacerbates the neural injuries more associated with OSA [25]. Depression and OSA are both conditions that decrease the quality of life of a patient compared to normal people [26].

Obstructive Sleep Apnea and Clinical Outcomes

OSA is a globally growing epidemic around the world. Apnea and hypoxemia episodes caused by the collapse of the upper respiratory tract occur during sleep and result in sleep disturbances [27]. Due to excessive daytime sleep, most OSA patients are not alert and demonstrate poor concentration, factors which could be the cause of severe mood disorders [17]. OSA is a major risk factor for CAD mortality and morbidity, especially in men 40 to 60 years of age [28]. OSA is also a major risk factor for CVD and stroke [29]. Moreover, OSA is highly associated with psychiatric disorders, predominantly MDD. Patients with psychiatric disorders, who are also showing symptoms of sleep disordered breathing, must be screened for OSA [30]. In OSA patients, neurocognitive function greatly improves after the treatment through continuous CPAP therapy, because sleep deprivation improves and the patient feels more rejuvenated and energetic, ultimately improving their quality of life [31]. OSA is an independent risk factor of CVD, hypertension, stroke, and EDS, obesity is a major cause of OSA; controlling obesity is the primary strategy to overcome and prevent OSA [32]. Severe OSA is related to a higher mortality [33]. OSA is related with excessive daytime sleepiness (EDS), which can cause preventable traffic accidents and injury [34]. CPAP therapy along with pharmacotherapy more effectively reduces hypertension compared to pharmacological treatment alone [35]. OSA causes severe morbidity and mortality. CPAP therapy greatly reduces these risks [36]. In OSA patients, treatment with CPAP therapy improves EDS and mood disorders; additionally, the traffic accident rate can be reduced [37]. Even the most seemingly insignificant single component of OSA, snoring, can play a significant part in causing CVD, hypertension, and cerebral infarction due to hypoxic episodes; treatment with CPAP can improve these associated conditions [38]. In older depressed patients, OSA should be ruled out before antidepressant pharmacotherapy is implemented because antidepressant medications do not help to treat the depressive symptoms that are produced by OSA. There is an additional need for CPAP therapy to

follow up with response to the depressive symptoms of OSA [39]. OSA and depression must be diagnosed accurately so that their treatment strategy is not compromised. Undiagnosed sleep apnea can interfere with the proper treatment of a patient, and patient depressive symptoms cannot be addressed properly by using antidepressant pharmacotherapy [40]. Therefore, to effectively treat all facets of OSA, a comprehensive diagnosis should be sought.

Depression, Coronary Artery Disease and Obstructive Sleep Apnea

People who are depressed have a high risk of developing CAD [41,42]. MDD is a major risk factor of CAD [43]. MDD is also a major risk factor of persistent angina [44]. Depression is a major risk factor of angina, and depressive patients can show a poor prognosis even after revascularization surgery if the depression is not treated [45]. There is a release of inflammatory markers both in depression and CAD. These inflammatory markers are IL-1, IL-2, IL-4, IL-6, IL-10, TNF- α [46-48]. This inflammatory process can lead to fibrinolysis and thrombolysis, which can also increase the risk of CAD [49]. Studies show that women who are depressed have an increased risk of CAD, and there should be a screening-as well as a treatment plan-for the patients that should be implemented by the health care providers and the government officials, even in the most remote areas of the country [50]. MDD is a major risk factor of CAD and should be screened at the earliest possible time, because without treatment of the depression, the prognosis of CAD would be poor. The screening of depression could be accomplished using Patient Health Questionnaire-9 (PHQ-9) after myocardial infarction [51]. CAD associated with OSA has better clinical outcomes after CPAP therapy. CPAP therapy greatly reduces N-Terminal Pro-brain Natriuretic Peptide (NT-pro BNP) and high levels of sensitive troponin T (hs-TropT) [52,53]. In MDD, patients sleep disturbance is greatly reduced by regular exercise, along with pharmacological treatment [54]. Regular exercise produces better clinical outcomes in both MDD and CAD [55].

Pharmacological Treatment of Depression: An Overview

Drugs designed to treat MDD are mainly MAO Inhibitors, SSRI, and tricyclic antidepressants [56]. Antidepressants are significantly used to treat MDD [57]. SSRI such as Vortioxetine improves cognitive functioning in MDD Patients [58,59]. Monoamine oxidase inhibitors (MAO) are also used to treat MDD [60]. In MDD, SNRI-such as duloxetine can also be safely used, along with associated CVD [61]. For MDD associated with CVD, selective and reversible monoamine inhibitors are also commonly used drugs for treatment [62] SRI and serotonin reuptake inhibitors (SNRI) are also commonly used drugs for the treatment of MDD [63].

Antidepressants Overdose Effect on Cardiac Function

Overdoses of tricyclic antidepressants (Amitriptyline, Nortriptyline) have severe toxic side effects related to cardiac function, toxicity, seizures, hypotension, arrhythmias and refractory QRS complex widening [64-66]. Overdose of Serotonin reuptake inhibitors (SNRI) including venlafaxine, fluoxetine, fluvoxamine, paroxetine, and citalopram, can cause

seizures, drowsiness, and hypotension. Overdose toxicity is also higher, with citalopram EKG findings showing a prolongation of the QT interval and a widening of QRS [67-71].

Psychosocial Health

In OSA patients, sleep disturbance causes significant psychological health impairment [72]. Studies have shown that female caregivers with OSA have more severe problems compared to non-caregivers, such as EDS, fatigue, and poor concentration [73]. In OSA and MDD, when sleep is disturbed, the patient's psychosocial health is also significantly disturbed. Due to EDS, fatigue and poor concentration, the individual cannot enjoy the time socially and feel abandoned and isolated from the society. To resolve these issues, the quality of sleep must be addressed properly in the health care system [74]. In older people, the incidence of OSA and depression are both higher. Advanced age, high BMI and EDS have increased risk factors for OSA and MDD in older people, and these patients present with poorer psychosocial health [75]. Individuals with eating disorders, especially binge eating disorder (BED), are more prone to obesity and OSA. Additionally, the depressive symptoms are higher in patients with associated BED and OSA compared to patients diagnosed with OSA alone. Patients with OSA and BED have poorer physical and mental health and their quality of life is decreased compared to patients without OSA or BED [76]. OSA patients have an impaired quality of life, poor participation in social life, more problems at work, poor concentration, and disturbed sleep. Not only is their mental health impaired, but they are also at higher risk for CVD [77]. OSA and impaired mental health are highly associated conditions [78]. OSA has a high comorbidity with MDD and both are more common in patients with poor family support, who live alone, and have a lack of social support [79]. In OSA patients, quality of life is low compared to that of the general population. However, the accurate diagnosis of OSA and proper treatment can improve each patient's quality of life by treating their depressive symptoms related to OSA [80].

OSA patients not only show impaired mental health but their physical health is also compromised compared to people without any sleep problems [81]. Patients with OSA have work related problems, especially in terms of executive tasks. The cognitive symptoms in OSA interfere significantly with a patient's work performance and daily life [82]. The quality of life in OSA patients is greatly compromised when cognitive symptoms are severe and predominant [83]. When a patient is diagnosed with OSA, associated anxiety and depressive symptoms are often also present. It is the responsibility of healthcare professionals to treat the psychological symptoms and to give complete and comprehensive treatment guidelines to patients. Adherence to the CPAP therapy can offer significant results and improve a patient's psychosocial health [84]. In OSA patients, cognitive symptoms especially mood symptoms greatly improve after treatment with CPAP therapy [13]. In OSA patients, treatment adherence is very important. If the underlying cause of the patient's OSA is obesity, then that patient should be educated and encouraged to lose weight, exercise, and work on diet control. If all other treatment measures fail, then surgical procedures should be performed. Patient self-motivation and family support are very necessary to improve each patient's physical and psychosocial health [85].

Discussion

It has been well established through various studies that there is an association between OSA and depression. In order to effectively treat either related condition, primary care physicians must offer treatment solutions for both. Some of the manifestations of depression, including difficulty concentrating, feeling tired, decreased energy, and the feeling of not having had a restful sleep may also overlap with the features of OSA. It is fathomable that patients with OSA might wake up with an irritable or a depressed mood. These issues make it hard to separate the two conditions in terms of diagnosis and treatment. Using sedation, antidepressants, or hypnotics to treat insomnia related to depression may exacerbate OSA, which in turn may worsen the patient's mood. It makes a lot of clinical sense to screen patients with OSA for depression and reciprocally to evaluate patients who are depressed for OSA. Early detection of each disease and the development of prevention/treatment strategies can help reduce the risks associated with both diseases.

Conclusion

Patients with OSA have impaired health and their psychosocial health and daily performance also decrease. Because disturbed sleep can cause poor concentration, mood problems, anxiety, and MDD, these factors are also the part of poor daytime performance [86]. The medical therapy of choice for OSA is CPAP, but proper education and patient adherence to treatment is important for treatment to be successful and offer measurable results [87]. CPAP treatment has been shown to improve the depressive symptoms associated with OSA [88]. CPAP therapy also improves the quality of life for OSA patients [89]. If OSA does not improve with CPAP treatment, then surgical procedures are also advised to overcome the physical and depressive symptoms of OSA [90].

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Abbreviations

BDI	Beck Depression Inventory
PHQ	Patient Health Questionnaire
OSA	Obstructive Sleep Apnea
CAD	Coronary Artery Disease
MDD	Major Depressive Disorder
NT-Pro BNP	N- Terminal Pro-Brain Natriuretic Peptide
hs-Trop T	High Levels of Sensitive Troponin T
MAO	Monoamine Oxidase Inhibitors
SNRI	Serotonin Reuptake Inhibitors
BED	Binge Eating Disorder
PSG	Polysomnography

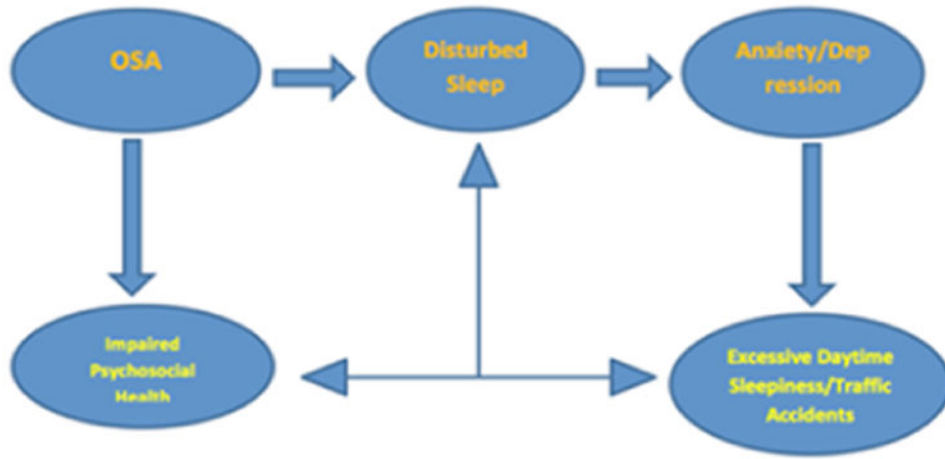


Figure 1.
OSA and Its associated pathology.

Table 1

Association of OSA and Depression.

Associated Disease	Symptoms	Diagnostic Criteria	Treatment
OSA	Disturbed sleep, obesity, snoring, anxiety.	Symptoms + PSG	Weight loss, CPAP
Depression	Disturbed sleep, weight gain/weight loss, sadness, impaired concentration, anhedonia, recurrent thoughts of death. (DSM-5)	Clinical Diagnosis	Antidepressants, ECT
OSA and Depression	Disturbed sleep, restlessness, anxiety, weight gain, tiredness, traffic accidents, impaired psychosocial health		

- a) Electroconvulsive therapy (ECT).
- b) Polysomnography (PSG).
- c) Continuous Positive Airway Pressure (CPAP).

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